

87. For instance, in a regulatory bulletin, Eurex US, a former derivatives exchange that owned a clearinghouse, stated that investors must ensure that market participants trade for one of three legitimate economic purposes, expressly including price discovery:

"The Exchange would like to remind Members of the responsibility to ensure that bids and offers are entered on the Trading System for legitimate economic purposes. Eurex US Rule 308(p) provides that Members shall not 'Engage in conduct or practices inconsistent with just and equitable principles of trade or conduct or practices detrimental to the best interests of the Exchange.' Legitimate economic activity includes hedging, speculation, and price discovery."<sup>75</sup>

88. Similarly, the CME Group, an options and futures exchange, considers price discovery (along with risk management) as one of its two most important functions.<sup>76</sup> For price discovery, the CME Group uses daily settlement prices, which it defines as the "fair market value of a commodity or financial derivative as determined by buyers and sellers in a market at a particular point in time known as the settlement period."<sup>77</sup> Hasbrouck (2002) notes that "true" (or efficient) prices are generally unobservable, so that empirical studies often focus on price changes to efficient prices to measure price discovery.<sup>78</sup> In the absence of directly observable "true" prices, settlement procedures typically weigh actual transactions more heavily than bid and ask quotes. Likewise, in somewhat of a

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<sup>75</sup> Eurex US regulatory Bulletin, "Legitimate Economic Purpose Required for Trading at Eurex US; Intrafirm Trading," Rule 308 #5-008, Date Issued: April 13, 2005, Effective Date: April 14, 2005, Exhibit Rose-17.

<sup>76</sup> CME Group, "Quick Facts on Settlements at CME Group," October 2014, Available at: <https://www.cmegroup.com/trading/agricultural/files/settlementprice-fact-sheet.pdf>. See also DRWI001942 – DRWI001943 (email from CME Group to DRW stating: "If you are available/interested in submitting options price contributions today we would very much appreciate your input. We will send you futures settlements as soon as we receive them in order to speed up the option settlement process. If we don't receive contributions, we are planning to use the volatility skews from Monday Nov 10<sup>th</sup> and apply today's futures settlements and update puts and calls with the new futures settlement price.")

<sup>77</sup> CME Group, "Quick Facts on Settlements at CME Group," October 2014, Available at: <https://www.cmegroup.com/trading/agricultural/files/settlement-price-fact-sheet.pdf>.

<sup>78</sup> See Hasbrouck, Joel. "Stalking the "Efficient Price" in Market Microstructure Specifications: An Overview," *Journal of Financial Markets* 5 (2002): 329-339.

pecking order, bid and ask quotes are typically weighed more heavily than are prices from other markets.<sup>79</sup>

89. Because the clearinghouse takes on the full counterparty credit risk in futures markets, in the event that a party to a transaction defaults, the clearinghouse must be able to find a replacement party to the transaction in order to avoid losses. If settlement prices do not reflect fair market value, this would not be possible. Defaults to the clearinghouse can be extremely costly. When MF Global went bankrupt in October 2011, for instance, the CME Group (MF Global's primary U.S. clearinghouse) was forced not only to cover the defaulted funds, but also to establish a separate \$100 million fund to protect other customers (including family farmers and ranchers).<sup>80</sup> The MF Global default also imposed reputational costs and other management costs on the CME to the point where the exchange started a specific web page dedicated solely to MF Global news, including five "Clearing Advisories" and references to "restoring confidence."<sup>81</sup>
90. Therefore, in futures markets, settlement periods (governed by specific rules) are dedicated to collecting the most diverse set of potential buyers and sellers to establish

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<sup>79</sup> For instance, CME settlement procedures for interest rate swap futures use a 2-tier approach that prioritizes trades during specific periods over bid and asks and other market information. Available at: <http://www.cmegroup.com/confluence/display/EPICSANDBOX/Interest+Rate+Swaps>.

Similarly, CME Gold and FX Futures settlement procedures are very specific, for instance, ranking trades as Tier -1, quote midpoints as Tier-2 and one-sided quotes as Tier-3 settlement price determinants to be weighed before considering "other market information." Available at: <http://www.cmegroup.com/confluence/display/EPICSANDBOX/Gold> and <http://www.cmegroup.com/confluence/display/EPICSANDBOX/Mexican+Peso>.

<sup>80</sup> See CME Group Press Release, "CME Group Establishes \$100M Fund to Provide Additional Protection for Family Farmers and Ranchers", February 2, 2012. Available at: <http://investor.cmegroup.com/investor-relations/releasedetail.cfm?ReleaseID=645279>.

<sup>81</sup> See CME Group Website, "CME Group Information Regarding MF Global." Available at: <http://www.cmegroup.com/clearing/mfglobal.html>.

robust prices for clearing and settlement purposes. Markets assess settlement prices over an appropriate length of time, and typically include (in descending order of importance) some combination of transaction prices, bid and ask quotes, and volume from both floor-based and electronic markets (where applicable). In the absence of specific pricing data on an individual futures contract, settlement committees (comprised of exchange staff) often benchmark settlement prices to other contracts, earlier data, or other available market information to determine an appropriate settlement price.<sup>82</sup> On occasion, settlement procedures may specify spread criteria when benchmarking to these other pricing sources. Importantly, the exchange and/or the clearinghouse control these rules and are solely responsible for producing daily settlement prices.<sup>83</sup>

91. In sum, exchanges (and clearinghouses) conduct price discovery for establishing settlement prices using the following mechanisms:

- a. A measure of market activity during settlement periods;
- b. A survey of market participants;
- c. An auction-based price determination; and
- d. A model-based interpolation of prices.

92. Thus, it is reasonable for market participants to expect that their views of fair value can and should be considered by the clearinghouse, as DRW's were here.

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<sup>82</sup> As noted in "Challenges of Price Discovery in Illiquid Commodity Markets: A White Paper about Pricing Minor Metals," *Ferro-Alloys and Rare Earths*, February 2014, Metal-Pages, Ltd, price discovery in illiquid commodity markets can rely "on canvassing a wide range of market participants by telephone or via electronic communications such as email." See also Green, Richard C., Li, Dan, and Schürhoff, Norman. "Price discovery in illiquid markets: Do financial asset prices rise faster than they fall?" *Journal of Finance* 65.5 (2010): 1669-1702.

<sup>83</sup> For instance, see IDCH Rulebook, p. 100.

**D. IDCH's Actions Indicate DRW's Bids Enhanced Price Discovery**

93. In light of the importance of price discovery to exchanges and clearinghouses, it makes no economic sense for IDCH to incorporate DRW's bids into the Three Month Contract's settlement prices unless IDCH itself understood that these bids reflected true economic value and were more "fair and appropriate" than the Corresponding Rates.<sup>84</sup> It is my understanding that, on or about December 15, 2010 IDCH (in response to DRW's inquiry into why its bids for the Three Month Contract placed through a voice broker were not being incorporated into the IDEX Curve) told DRW to quote directly into the electronic platform if it wanted its bids considered for incorporation into the IDEX Curve.<sup>85</sup> IDCH subsequently provided a list of third party vendors that could facilitate DRW's transmission of bids directly to the electronic platform.<sup>86</sup> These actions by IDCH hardly suggest that DRW's bids were at artificial prices, but rather suggest that it was encouraging DRW to engage in price discovery—*i.e.*, encouraging DRW to contribute electronic quotes as a legitimate source of supply or demand for the Three Month Contract.

94. Following IDCH's recommendation, DRW hired Sky Road, LLC to develop a platform that would enable DRW to place bids on the Three Month Contract electronically.<sup>87</sup> Subsequently over an extended period of months, IDCH started incorporating DRW's bids into its settlement prices. If incorporating these bids established artificial prices, as

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<sup>84</sup> IDCH Rulebook, p. 100.

<sup>85</sup> DRW Letter to IDCG, Investigation Number IDCH II 2011-1, February 18, 2011.

<sup>86</sup> Email from IDCG to DRW, December 20, 2010, D0165286.

<sup>87</sup> Complaint ¶¶47-48.

alleged in the Complaint, then IDCH was acting contrary to its own economic incentive to establish prices that better reflect fair value.

95. Further, in a February 18, 2011 letter from DRW to IDCH explaining its bidding, DRW asked IDCH to let DRW know if there was any problem with the bids it is posting.<sup>88</sup> The fact that IDCH apparently did not report any problem and continued to incorporate DRW's bids indicates that it reviewed the information it received, deemed it a valid source of price discovery, and thus concluded that it was appropriate to incorporate DRW's bids into its settlement curve.

**XI. THERE IS NO BASIS FOR ALLEGING THAT DRW MANIPULATED MARKET PRICES OR MADE AN ILLICIT PROFIT**

**A. DRW's Bids Were Consistent with Economic and Financial Theory and Thus DRW Would Have Wanted to Transact at the Prices it Bid**

96. As documented above, DRW's bids on the Three Month Contract were in line with rational economic models of the fair value of the contract. Both valuations that I conducted under the Hull-White One-Factor model described above yield premiums over the Corresponding Rates consistent with the explanations DRW has made for its bids. The premiums over the Corresponding Rates reflect the NPV and convexity effects that DRW maintained to be relevant in the valuation of the cleared Three Month Contract.

97. In fact, valuation analyses performed in Section VIII of this report confirm the soundness of the previous assessment of the Three Month Contract provided by Cont *et al.* (2011). The NPV and convexity premium illustrated in those analyses approximates

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<sup>88</sup> DRW Letter to IDCIG, Investigation Number IDCH II 2011-1, February 18, 2011.

the premium provided in the Cont *et al.* (2011) illustrations. The estimated premium increases with longer term tenors and varies over time, as theory would predict. These results establish that DRW's bids submitted during the Settlement Period represented a closer approximation of fair value for the Three Month Contract than did the Corresponding Rates.

98. Moreover, these results support my opinion that DRW acted with rational economic behavior for speculation and price discovery. Any rational market participant who valued the Three Month Contract as DRW did would have had the incentive to produce bids at higher rates than the Corresponding Rates, to try to attract a potential counterparty. At small premiums above the OTC interest rate swap curve, DRW's bid prices stood out as the best bids. According to DRW's pricing model, its bids were generally at or below its view of fair value, and, as such, the bids held the possibility of attracting profitable trades for DRW.
99. Contrary to the CFTC's claim that DRW's bids created prices not reflecting legitimate supply or demand, my empirical results show otherwise. Based on my estimations, DRW's bids, while higher than the Corresponding Rates, were largely lower than the fair value rates. If other investors were using models similar to those employed by DRW, they likely would have viewed many of DRW's bids as too low. Despite the fact that DRW's bids were higher than the Corresponding Rates, an investor with a similar model would not be inclined to sell at rates below fair value. In this regard, the dearth of transactions against DRW's bids indicates that these bids were in fact valid and not at artificial prices by any means. To have ignored DRW's bids and defaulted to the Corresponding Rates would have been inappropriate and ultimately artificial.

100. In fact, my empirical work in Section VIII shows that DRW's bids were in fact closer to fair value than were the Corresponding Rates. While the CFTC advocates the use of OTC interest rate swap prices as a simple benchmark, this benchmark is flawed.<sup>89</sup> As noted in Section VII and verified empirically in Section VIII above, the fair value of the cleared Three Month Contract consists of the Corresponding Rate plus the NPV and convexity effects. My estimates of these latter two effects comport well with DRW's explanations that its bids more closely represented fair value for the Three Month Contract than a simple comparison with Corresponding Rates.

101. By bidding at rates higher than the Corresponding Rates, it appears that DRW's bids were the best available to IDCH. By quoting competitively, both during the trading day generally and during the Settlement Period, DRW stood ready to trade against less sophisticated market participants or those with a different view on the value of the Three Month Contract. This behavior stands the test of economic rationality, and my opinion is not tempered by the fact that some of DRW's bids were made during the Settlement Period. To the contrary, as described in Section X above, such behavior of competitive bidding based on informed judgment is consistent with price discovery in the marketplace, something traders, exchanges, clearinghouses and, more importantly, regulators should - and do - encourage.

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<sup>89</sup> "The [Three Month Contract] Jefferies entered into through IDCH were not economically equivalent to uncleared [OTC Interest Rate] Swaps of the same terms" and "IDCG's representations that its [Three Month Contracts] were "economically equivalent" to those of OTC [Interest Rate] Swaps were false in that the absence of a PAI adjustment in its [Three Month Contract] made it inappropriate to price its [Three Month Contract] identically to OTC [Interest Rate] Swaps; in addition, the [Three Month Contract] exposed Jefferies to a substantially different risk profile than in the case of OTC [Interest Rate] Swaps of identical notional value and maturity." See Findings of Fact and Conclusions of Law, January 9, 2013, ¶7 and ¶29, JEF-CFTC-476403-33.

102. The pattern of swap futures pricing from OTC interest rate swap curves to a futures-specific curve that incorporates the convexity effect is not new. Gupta and Subrahmanyam (1999) thoroughly explore whether a convexity correction has been efficiently incorporated into interest rate swap pricing over time in the four major international currencies. They find evidence that swap futures contracts were mispriced during the earlier years of the study when the adjustment for convexity effect was ignored (and simple OTC interest rate swap rates were applied), but this mispricing was gradually eliminated by incorporating the adjustment for convexity effect in currency swap futures pricing over time. They surmise the slow change to incorporating the adjustment for convexity effect to market frictions as well as internal or external constraints on bank participation in futures markets. Just as in the Three Month Contract, eventually the market learned.

103. I conclude that DRW did not manipulate market prices or create artificial prices by bidding above OTC interest rate swap rates during the Three Month Contract's Settlement Period. My analysis supports DRW's contention that each of its bids reflected proprietary analysis of the fair value of the Three Month Contract. DRW's bids did not create artificial prices, but rather reflect attempts to transact at what would have been largely profitable trades and to contribute to price discovery by bringing settlement prices closer to true value.

#### **B. DRW's Bids Reflected a Willingness and Desire to Trade**

104. The CFTC's contention that DRW's bids created artificial prices is incorrect. The CFTC makes much of the fact that few, if any trades were consummated against DRW's bids. Based on my empirical assessment of these bids, however, DRW stood ready to trade at the prices it was bidding and, as a result of its analysis, believed that it could have made